APPENDIX B
ADVANCED TECHNOLOGY DEVLEOPMENT PROJECTS

A. Advanced Technology Development Section Program Schedule

CEC received $2 million dollars for fiscal year 1999/2000 and $2.2 million for fiscal year fiscal year 2000/2001 for the Advanced Technology Development Section of the Carl Moyer Program. Table B-1 illustrates the schedule for the solicitations.

Table B-1
Advanced Technology Program Schedule

Milestone	1999/2000	2000/2001
PON Release	November 1999	November 21, 2000
Workshop	January 17, 2000	January 17, 2001
Application Deadline	February 15, 2000	February 13, 2001
Notice of Proposed Award	April 5, 2000	April 4, 2001
Commission Business Meeting	May 31, 2000	May 30, 2001
Award Start Date	June 1, 2000	May 31, 2001

B. PROJECT DESCRIPTIONS/STATUS:

1. FY 1999/2000 Funded Projects

Ceryx proposed to build and demonstrate its QuadCAT Four-Way Catalytic Converter device to reduce oxides of nitrogen (NOx), particulate matter (PM), hydrocarbons (HC), and carbon monoxide (CO) emissions from diesel engines. It was estimated that the proposed technology would reduce NOx by at least 45%, and PM, CO and HC by more than 90%. This technology does not require low sulfur fuel. Ceryx projected over 50,000 tons of NOx would be reduced by 2010 at a cost-effectiveness of $5,604 per NOx ton reduced. The project came to a halt when the company encountered financial difficulty and ultimately declared bankruptcy.

Delphi Energy & Chassis Systems proposed to develop a heavy-duty diesel truck exhaust aftertreatment system using non-thermal plasma technology to reduce NOx by 80%, particulate matter by 90%, and achieve these goals without increasing fuel consumption by more than 3%. The project is proceeding with the following five tasks:

1) develop a durable plasma reactor,
2) identify a durable catalyst system,
3) develop an on-board power supply/controller to energize the reactor,

4) develop an inexpensive lean NOx sensor and closed-loop control system, and
5) design the overall electrical system to avoid electromagnetic interference with or by other vehicle systems.

Engelhard proposed to collaborate with National Renewable Energy Laboratory (NREL) and ARCO to develop a retrofit kit to reduce NOx using an Exhaust Gas Recirculation (EGR) system and a patented catalyzed soot filter (DPX^{TM}). The performance targets of 50% NOx reduction, 90% PM reduction, and 80% HC+CO (FTP cycle) would be demonstrated with ARCO's EC-Diesel ultra-low-sulfur diesel fuel. Phase I is the design and construction of a prototype kit for fleet trial installation. Phase II is a fleet demonstration to monitor vehicles in use and perform chassis dynamometer testing.

Detroit Diesel proposed a major redesign of its Series 50G 8.5 liter natural gas engine, primarily marketed for transit buses, based on the Series 50 and Series 60 diesel engines. The redesign involves improvement in cylinder head and piston bowl configurations and particularly air-fuel ratio control to optimize combustion stability, efficiency, and extend the lean misfire limit. These improvements are intended to allow certification to ARB's alternative 0.5 g/bhp-hr NOx standard with no increase above the current PM level of 0.01 g/bhp-hr. The project is proceeding and DDC has announced commercial availability in
Fall 2002.

Cummins Westport, Inc. proposed the further development of it's HPDI (high-pressure direct-injection) natural gas version of the Cummins 1.5 liter ISX diesel engine to attain 0.5 g/bhp-hr NOx emissions. The HPDI system injects a pilot quantity of diesel fuel (= 10%) to initiate combustion and then injects the main charge of natural gas, providing the performance and fuel efficiency of a conventional diesel engine. The further development involves the addition of exhaust gas recirculation and a variable geometry turbocharger (to be provided on the diesel base engine to meet October 2002 emission requirements) and recalibration for the higher level of EGR flows tolerable with natural gas to further reduce NOx emissions. The project is proceeding.

2. FY 2000/2001 Funded Projects

ISE Research Corp. proposed to develop and demonstrate a 60 kW Capstone MicroTurbine integrated into propane-powered series electric hybrid 30 ft. transit buses operated by the Los Angeles Department of Transportation. Prototypes of this new engine have achieved emission test results below the 2007-2010 standards of 0.20 g/bhp-hr NOx. The engine is being developed to use diesel fuel, propane, or natural gas. The project is proceeding.

Sorbent Technologies Corp. proposed to further develop a technology originally developed to reduce NOx emissions from jet-engine test facilities, and demonstrate the technology on heavy-duty stationary diesels and large truck engines. The technology

involves adsorption of NOx followed by desorption and Selective NOx Recirculation back into the engine, reducing NOx emissions by up to 90%. The project is proceeding.

SCAQMD and NREL proposed to demonstrate heavy-duty vehicles fueled with Fischer-Tropsch "GTL" synthetic diesel and retrofitted with aftertreatment systems to reduce NOx and PM emissions.

Cummins Westport, Inc. proposed to develop an upgraded B Series Gas engine for truck classes 3-6 with emissions at or below 0.5 g/bhp-hr NOx and 0.01 g/bhp-hr PM. The project will initially upgrade the B5.9G with technologies involving a diesel engine computer system and computer diagnostics that is expected to reach 1.2 g/bhp-hr NOx. This version is expected to be commercialized, followed by evaluation of NOx adsorber aftertreatment technology from Goal Line Environmental Technologies. The addition of the NOx absorber is expected to result in 0.5 g/bhp-hr NOx for possible production in 2004, followed by further development to reach 0.2 g/bhp-hr NOx levels for 2007. The project is proceeding.

Cummins Westport, Inc. separately proposed with PACCAR Inc. to develop a Class 3-6 vehicle designed primarily for CNG, and a Class 7-8 vehicle designed primarily for LNG. The project will involve careful screening of vocations, chassis, and engines, with life cycle cost modeling and customer input, to determine business cases for the final choices. The project is proceeding.